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December 31, 1966

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Declass Review by NGA.



Subject: Proposal for Research Effort in Support of High Precision Stereo Comparator

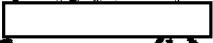
Reference:

- (a) SBC proposal dated May 20, 1966
- (b) Contract 

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Dear Bill:

As a result of our telephone discussion this week, I have revised our reference (a) proposal to provide for technical contributions more precisely aimed at your precision stereo comparator program.

We propose a time and material contract in the amount of  with the same terms and conditions of the reference (b) contract with one exception. Since the conflict of interest section is no longer pertinent we request it be deleted.

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The enclosure (a) Technical Proposal defines four tasks:

- Task 1 the Necessary Accuracy
- Task 2 the Contribution of Stereo
- Task 3 the Contribution of Film Distortion
- Task 4 Calibration

At present we contemplate approximately equal effort on each task. We anticipate, though, that the relative emphasis on the tasks will be established by the Technical Representative of the Contracting Officer.

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The Enclosure (b) Cost Proposal includes the work statement and cost estimate. It is estimated the proposed work will require approximately 5 months elapsed time.

STAT [redacted] is pleased to submit this proposal and we are, we believe, uniquely qualified to perform the proposed work. For some time we have been intimately involved with problem analysis closely associated with film comparator development criteria. Enclosure (c) is a list of the studies we have performed and the reports submitted in this connection.

Very truly yours,

[redacted] STAT

[redacted] STAT

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Encl. (a) Technical Proposal
Encl. (b) Cost Proposal
Encl. (c) Compilation of [redacted]
Studies and Research Effort relating to the
High Precision Stereo Comparator. STAT

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Enclosure (a)

Technical Proposal

Research Effort in Support of
High Precision Stereo Comparator

Task 1 the Necessary Accuracy

An analysis will be made of the accuracies imposed on the machine by the various measuring tasks. Length, angle and other specialized measurements when computed as a function of point position coordinate measurements, impose their accuracy requirement on the point measurement. Normally, desired accuracies are not achievable and an analysis of errors is required to separate accuracy requirements into constituent factors.

As data becomes available from other studies and other sources, the contribution of operator pointing, film distortion, optical geometry and mission parameters will be included in an analysis of variance. An attempt will be made to determine the relative importance of the error contribution of the measuring machine.

Task 2 the Contribution of Stereo

There is considerable qualitative evidence that stereo improves measuring accuracy. In addition, there is ~~considerable~~ ^{considerable} body of reports on stereo. ~~The~~ ^{This} literature will be reviewed and the data extracted which is pertinent to the precision comparator criteria. An attempt will be made to establish quantitative evidence for the contribution of stereo to measuring accuracy.

Task 3 the Contribution of Film Distortion

It appears that the problem most appropriate for initial consideration is a thermal one. We will therefore concentrate our attention in this task on a heat balance model.

We will establish an analytical heat balance model, transient and steady state, for film which is vacuum clamped to a glass platen and illuminated with high intensity light.

Enclosure (a)

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A literature search will be made for experimental data on various film coefficients at various optical densities such as:

- a) Thermal coefficient of expansion of film and variation with humidity.
- b) Thermal conductivity of film.
- c) Emissivity and view factor of film.
- d) Convective heat transfer coefficient.

Where coefficients are not reported, we will attempt to derive an estimated value from known related technology. We anticipate it will be possible to establish an analytical expression for the two-dimensional transient temperature distribution in the film as affected by the above coefficients and:

- a) Ambient temperature and humidity changes.
- b) Absorption of radiation from the light source.
- c) Cooling jets of air.

Task 4 Calibration

It may be impractical that → Ready and reliable calibration of the precision comparator to a separate objective standard is desired. ~~It is undesirable that~~ a machine be considered to be completely self-checking and self-polishing. Most desirable, of course, is that determination of measurement accuracy be traceable directly to the Bureau of Standards standards of length.

We will examine the feasibility and make an analysis of the errors of calibration to recommend a course of action.

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Enclosure (b)

Cost Proposal

Research Effort in Support of
High Precision Stereo Comparator

Work Statement

STAT

 will furnish professional services on a time and material basis to make the analytical studies and literature surveys for performance of the tasks defined in the accompanying technical proposal.

Period of Performance

February 1, 1967 through June 30, 1967

Reports

Results will be presented in technical reports prepared as appropriate for each task.

In addition, monthly reports of activities will be submitted to the Contracting Officer.




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Enclosure (c)

Compilation of  Studies and Research Effort relating to the High Precision Stereo Comparator.

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1. October 30, 1964: "Report on Orientation and Briefing Meeting, High Precision Stereo Comparator."
2. November 9, 1964: "Preliminary Technical Report on Submicron Measurement Error Analysis: Materials."
3. April 30, 1965: "2nd Preliminary Technical Report on Submicron Measurement Error Analysis: Materials."
4. June 30, 1965: "3rd Preliminary Technical Report on Submicron Measurement Error Analysis: Structural Dynamics."
5. July 30, 1965: "4th Preliminary Technical Report on Submicron Measurement Error Analysis: Building Vibration."
6. September 30, 1965: "Submicron Measurement Error Analysis: Comments on Some Vibration Measurements."
7. February 1, 1966: "Laser Metrology."

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